Introductory lecture on natural philosophy / by Benjamin Dewitt.

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INTRODUCTORY LECTURE

ON

NATURAL PHILOSOPHY.

BY

BENJAMIN DEWITT, M.D.

VICE PRESIDENT OF THE

COLLEGE OF PHYSICIANS AND SURGEONS,

AND

PROFESSOR OF NATURAL PHILOSOPHY IN THE UNIVERSITY OF THE STATE OF NEW-YORK.

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1818.

At a Meeting of the Gentlemen composing Vice President De Witt's class of Natural Philosophy, at the College of Physicians and Surgeons, New-York, December 10*th*, 1817, Benjamin P. Aydelott, M.D. *Chairman*, Richard B. Owen, of Tennessee, *Secretary*, *the following Resolutions were unanimously adopted:*

Resolved, That having been present at the Introductory Discourse of the Vice President of this College, Benjamin De Witt, M.D. we deem it our duty to express, in this public manner, the high satisfaction we experienced on that occasion.

Resolved, That in correspondence with the respectful opinion which we entertain of this eloquent and learned performance, a Committee of three be appointed to request from Dr. De Witt a copy for publication.

Resolved, That Benjamin P. Aydelott, M.D. Peter S. Townsend, M.D. and Jacob De La Motta, M.D. be that Committee; and that they be directed to communicate these proceedings to Professor De Witt.

In compliance with the above proceedings, the Committee addressed the following letter to Dr. De Witt, to which they received the annexed answer:

To Benjamin De Witt, M.D. Vice-President of the College of Physicians and Surgeons of the University of New-York, and Professor of Natural Philosophy in that Institution.

College of Physicians and Surgeons,
New-York, December 12, 1817.

Sir,

At a meeting held on the 10th of December, 1817, of the Gentlemen attending your Lectures on Natural Philosophy, delivered in the University of the State of New-York, Dr. Aydelott being in the chair, and Mr. Owen, of Tennessee, Secretary; after some explanatory remarks, the enclosed resolutions (vid preceding), were unanimously adopted.

Agreeably to these resolves, we the undersigned, a Committee deputed for that

purpose, thus tender you the respectful thanks of the Class; with their ardent wishes for the immediate publication of your luminous and comprehensive Discourse.

Permit us, sir, also, to add our cordial concurrence in the above measures, and our unfeigned regard for yourself.

We are, very respectfully,

Your's, &c.

BENJAMIN PARHAM AYDELOTT,
PETER S. TOWNSEND,
JACOB DE LA MOTTA,
} Committee.

Dr. De Witt.

New-York, 12*th December*, 1817.

GENTLEMEN,

You will please to tender my acknowledgments to the gentlemen of the University, for the favourable opinion they have expressed of my Introductory Lecture; and to accept for yourselves individually, my thanks for the respectful manner in which you have communicated to me,

their and your wishes to be possessed of a copy for publication.

Although it was written in haste, and in the midst of various other avocations, without any view to its being printed, yet as the perusal of it is desirable to you, I cannot refuse your polite request; knowing that, under these circumstances, its manifold imperfections will meet with your indulgence.

I am, very respectfully,

Your most obedient servant,

B. DE WITT.

Doctors Aydelott, Townsend, and De La Motta, } *Committee.*

LECTURE.

Gentlemen,

The science allotted to me in this University is *Natural Philosophy*, or (more precisely speaking,) the *Philosophy* of *Nature*. The term *Philosophy*, from its Greek derivation, means, *a love of knowledge*, and by the word *nature*, we understand, generally, all created objects.

But let us inquire more particularly what these objects are;—if we look around us, the first great object that arrests our attention, is this earth on which we tread, and which bears us up in all our movements;—we find it composed of solid materials: and it is of large dimension. It seems to be stationary; and

yet by the light of science we demonstrate that it is in perpetual and rapid motion, revolving with great velocity on its own axis, and at the same time having a projective course in its immense circuit around the sun. Notwithstanding these rapid revolutions, we stand unshaken in our own positions, and remain as firmly attached to this whirling ball of earth, as if it stood motionless in the midst of a moving universe. Hence we are led to discover that predominant power of nature, that wonderful property of matter which is called the attraction of gravitation. It is this which binds us down to our mother earth; it is this which prevents that earth from being dissipated and scattered in pieces throughout the regions of endless space; and it is this which regulates all its movements. The earth, then, is to us

one of the primary objects of nature, and the power which moves it, is one of the great laws of nature. These, then, are the legitimate objects of natural philosophy.

If we examine the surface of this earth, we find it is composed of a great variety of different materials. It is interspersed with rocks and stones, and metals, of various colours, and possessing in other respects an infinite variety of properties.—Surely, these also are objects of nature, and the composition, as well as the motion of this solid earth, is a fit subject of natural philosophy. This branch of the science is denominated mineralogy.

If now we extend our researches, we presently discover that a large portion of this globe is covered with a fluid substance, pos-

sessing peculiar properties altogether distinct from the solid materials we had contemplated. This liquid body, in the form of water, as it constitutes a large portion of our globe, so it has proportionably a great agency in the operations of nature. The constitution of this fluid, its peculiar properties, and the laws which govern its motions, are promulgated under the title of Hydrostatics, and constitute an important branch of natural philosophy.

But if there was nothing on the surface of this globe except the barren soil, and the bleak waste of waters, the prospect of nature would be dreary indeed. We accordingly find it covered with the green mantle of vegetation, and here a new creation rises to our view. The infinite variety in the ap-

pearance of this foliage, the exquisite delicacy and beauty of the blossoms which are scattered around with such profusion, and the variety of the sweet perfumes of the groves, all indicate the existence of a great number of different plants, and shrubs, and trees. The various qualities of these,—their peculiar nature,—their growth and formation from the elements,—and the laws of vegetable life, are therefore embraced in our science, and constitute that branch, which has been taught under the name of Botany.

This world of vegetation, although it is distinguished in an eminent degree, from the dull and dead earth which it overspreads, is nevertheless without motion and without sound. Each plant is ever fixed to the spot where it grows; it moves not, save when its top waves to the winds, and there is no sound

except the rustling of the leaves.—O! for the sweet notes of melody to animate the groves, and the human voice divine, to pierce into the silence and solitude of this wilderness of nature.—Accordingly the animal world appears before us, and we find creation filled with living bodies. In the midst of these, majestic and erect, stands man, the image of his Creator, and the lord of this lower world; surely these are important links in the chain of nature, and their philosophy is necessarily a part of the philosophy of nature. This science is embraced under the general term Zoology.

But, Gentlemen, look around you still, and see if there is nothing else attached to our earth. Is there nothing surrounding and embracing the world? or does it move in an empty void? At first sight there appears to

be nothing which immediately involves this globe, and thus far it would seem as if there was a vacuity in nature,—but here also the light of science shows us this invisible space filled with tangible and ponderous matter;—you have seen the trees bending, and the harvest waving to the winds;—you have seen the blossoms and the leaves borne aloft in the breeze, and the troubled ocean vexed into foam by the violence of the storm;—surely, then, this invisible atmosphere of our earth has weight; it has power; it has motion, it has solidity, and other properties of matter. This then is one of the proper objects of the philosophy of nature; it constitutes the science of Pneumatics.

This, however, is not all; though you cannot recognise this atmosphere by vision,

you can hear its vibrations in contact with other bodies. It warbles in the lute, it trembles in the harp, and it melts into melody in the human voice. In the wind it whistles, on the ocean it roars, and it thunders in the clouds. The science of sounds, and the laws which govern them, as well as those properties of the air and other bodies which serve as the medium of their motion and communication, form that branch of natural philosophy which has been termed *Acoustics*.

There is yet another important object of science in relation to the atmosphere—it is the air which alternately expands and represses our bosoms, in the act of respiration. When the human body was endowed with this faculty of breathing, surely nature meant something more by it, than merely to give mechan-

ical motion to the bosom—to make it heave with a sigh, or to give utterance to a groan—or even to delight us with the sound of music in the voice—or eloquence of speech. Yes, a more important purpose of respiration still remains; and this we learn from investigating other qualities in the composition of the atmosphere. In this view the circumambient air is found to be a compound mass of matter, consisting principally of two other compound materials intimately mixed. The most important, though least in quantity of these two materials, is emphatically denominated vital air; and this again is composed of three of the most active elements in existence; they are *oxigen*, *heat*, and *light* in a state of combination. The base of this vital air thus formed, is the most powerful ingredient in the atmosphere—the chief agent in respiration. It

is also an indispensable ingredient in almost all the other substances in the world: It is the principal material in the composition of water, and forms nearly nine-tenths of the bulk of that vast mass of fluid resting on the bosom of the earth; it enters largely into the formation of the firm and solid fabric of nature; it constitutes perhaps one-fourth part of all created matter; it is the chief agent in the economy of the natural world; it is concerned in most of the changes that take place in our globe, and in the form of atmospheric air, like the breath of the Almighty, it diffuses heat, and light, and life over all his works. Here then, we are initiated into a new world of science—a world which at first scarcely seemed to exist—which the benighted eye of ignorance beholds not; but which the light of philosophy

has displayed in all its grandeur and magnificence.

The atmosphere of this earth we perceive also is the receptacle of other bodies, and the medium of their distribution throughout nature:—It is often filled with "vapours, and clouds, and storms." It holds in solution vast quantities of water, which it precipitates in the form of dew, rain, hail, and snow. The laws which govern these, and all other things in the regions of atmosphere, whether they exhibit themselves in the aurora borealis—in the luminous track of shooting stars—or the ponderous masses of stone precipitated from the heavens, are embraced in the science of meteorology, which is an appropriate branch of natural philosophy.

But, gentlemen, what could we know of the works of creation, what could we say of the wonders of nature, if the objects we have mentioned were the only ones connected with us, and with this earth? All would still be darkness, and the world would be buried in oblivion.—Hence, the great Author of our system, in the morning of creation, said "let there be light, and there was light." This glorious element, continually showered down upon us from the sun, which is the inexhaustible source of it, gives life to the world, and diffuses joy throughout the universe.—"Its materiality is sufficiently proved;—its motion, though inconceivably rapid, is progressive, and may be measured; it may be stopped in its progress; or its direction may be changed. It may be condensed into a smaller, or dispensed over a larger space. It is inflected

when passing near to any body, which proves it to be subject to gravitation; and it produces chemical changes in bodies, which shows it to be subject to chemical attractions. Newton regarded light as an emanation of particles of extreme minuteness, projected in right lines from the sun, and from all luminous bodies, and moving with extreme velocity. This opinion has been generally received: it accords better than any other with the phenomena of optics, and appears to be established by the agencies which light exerts, its fixation in bodies, and its subsequent evolutions."

If this opinion is received, the minuteness of the particles of light must be astonishingly great. "There is, (says an elegant writer) no physical point in the visible hori-

zon, which does not send rays to every other point; no star in the heavens which does not send light to every other star. The whole horizon is filled with a sphere of rays from every point in it, and the whole visible universe with a sphere of rays from every star. In short, for any thing we know, there are rays of light joining every two physical points in the universe, and that in contrary directions. How great then must be the subtilty of these particles to prevent their interrupting each other."

This substance, then, is one of the most resplendent objects of our philosophy, and the study of it constitutes the science of Optics.

In addition to light, we find also the matter

of heat pervading almost all natural things. This also is in continual motion from one body to another. It warms and animates the world, which else would be cold, and dead, and motionless;—without its influence all nature would be congealed in icy fetters; not only the fluid waters which cover the earth would become solid, but probably also the very atmosphere in which we now move; for it is by the influence of heat only that it is brought into a gasseous or œriform state. This powerful agent of nature, therefore, comes within the scope of our science. The atmosphere contains likewise a large quantity of the *electric* and *magnetic* fluid. The late discoveries in chemistry have given a peculiar interest to the first of these; and the practical use of the latter in navigation,

makes it an important subject for the investigation of the natural philosopher.

We have now enumerated the principal objects connected with our world, which are the subjects of philosophical science; and you will naturally ask, are not these also embraced in natural history? I answer, they are so. But history and philosophy are exceedingly different. The historian of nature indeed furnishes many of the facts, the data and the phenomena on which the philosopher reasons, and from which the most important deductions are drawn; and thus the two sciences aid each other, and co-operate in the advancement of knowledge. Thus also anatomy furnishes the observations and the facts, from which the physiology, or, more properly speaking, the natural philosophy of the hu-

man body is drawn. Chemistry also gives you the experiments, and observations, with respect to the operations of the minute particles of bodies upon each other, from which the most important doctrines of the modern philosophy of nature are derived. All these sciences, therefore, are properly the handmaids of philosophy, and are eminently serviceable in the progress and advancement of knowledge.

There is yet another subject, gentlemen, of deep interest, which ought to be embraced in our system of natural philosophy, and that is the doctrine of the human mind. Surely that intelligence which dwells in man, is part of his nature, and in common with his body, is one of the noblest works of nature. But as the soul of man is said to be spiritual,

and not subject to the ordinary laws of matter, that part of our being has been excluded from amongst the physical sciences which constitute natural philosophy, and has been treated separately by authors, under the title of metaphysics. But so far at least, as the mind is influenced and governed by the body, and all those external agents which operate on the body, it must be considered as being under the influence of physical causes, and thus far it is certainly connected with the physical sciences included in natural philosophy; and I cannot help thinking with Stewart, that incalculable utility and advantage may be expected from applying to the science of mind, those sound rules of inductive philosophy, promulgated by lord Bacon, which have led to such splendid improvements in modern physics.

In opposition to this idea, it has been said, by an eminent writer, that inductive philosophy, or that which proceeds upon the careful observation of facts, may be applied to two different classes of phenomena; the first are those that can be made the subject of proper experiment, where the substances are actually in our power, and the judgment and artifice of the inquirer, can be effectually employed to arrange and combine them, in such a way as to disclose their most hidden properties and relations. The other class of phenomena are those that occur in substances that are placed altogether beyond our reach, the order and succession of which we are generally unable to control. These substances are not the subjects of *experiment*, but of *observation*, and the knowledge we may obtain by carefully watching their variations,

is of a kind that does not directly increase the power which we might otherwise have had over them. The phenomena of the human mind are then said to belong almost exclusively to this latter description, and thence it is inferred that it is not a proper subject of inductive philosophy. But this is sophistical reasoning, and has a tendency to discourage, rather than to promote the advancement of our knowledge.

In answer to this reasoning, I would ask, from whence did Sir Isaac Newton derive his astronomy?—were the heavenly bodies within the reach of his arm? could he control, and govern, and regulate their motions? —was not his science founded on *observations?*—and is not the human mind as much under our control and observation, as the

sun, and the moon, and the stars? Let, then, the study of the operations of the human mind be rescued from the hands of the metaphysician, and brought within the cognizance of the philosopher, and we may hope to see light brought out of darkness, and order out of chaos.—Let the sound principles of observation, experiment, and induction, be applied to the investigation of the mind by some modern Bacon, and all the subtilties and sophistries of the metaphysician will vanish in the light of true science, like the delusions of alchemy, in the furnace of the chemist.

We have thus passed in rapid review the great objects of natural philosophy, more immediately connected with the world we inhabit; but there are other worlds in the

great system of nature; there are other suns than that which illumines our day, and other moons than that which shines in our night—the whole host of heavenly bodies, so far as human observation extends—their various revolutions, and their laws of motion, constitute the science of astronomy: and this, also, is a stupendous department of knowledge, belonging exclusively to the natural philosopher.

Such, gentlemen, and so various and extensive is the science of philosophy—to become perfectly acquainted with all its parts, would require as many years of study, as we have hours allotted for our lectures. It cannot be expected, therefore, that we should enter into the minutiæ of all the doctrines. Many of you, indeed, must be, and all of you

ought already to be acquainted with the fundamental principles. My great object, therefore, will be to dwell particularly on those parts which are more immediately subservient to the study of medicine: and our present course may be considered rather as a series of essays, on the application of philosophy to medicine, than as an elementary course on philosophy itself. This arrangement will be most useful to you, and will best comport with the design of a great medical school.

In the prosecution of this subject, if you read no other book, you ought at least to peruse the works of Lord Bacon, the father of true philosophy.—"He excelled all other men in the range and compass of his intellectual view, the power of contemplating

many and distant objects together, without indistinctness or confusion, which he himself has called the discursive or comprehensive understanding. His wide ranging intellect was illuminated by the brightest fancy, that ever contented itself with the office of only ministering to reason, and from this singular relation of the two grand faculties of man, it has resulted that his philosophy, though illustrated still more than adorned by the utmost splendour of imagery, continues still subject to the undivided supremacy of intellect. In the midst of all the prodigality of an imagination, which had it been independent, would have been poetical, his opinions remained severely rational.—He was no metaphysician; but on that very account he was, perhaps, a better philosopher. It is singular, that he was also not a mathemati-

cian, nor an astronomer, nor a physiologist, nor a chemist; yet he was undoubtedly the greatest natural philosopher of the age. He made no discoveries of his own; but his whole life was employed in teaching the method by which discoveries were to be made. No man ever united a more poetical style, to a less poetical philosophy,"* and no one can, even now, read his writing without being enamoured of the subject on which he treats. He makes all nature appear sublime and lovely to our view—and we continue to pursue our study with increasing delight, until we arrive at the summit of knowledge and of truth.

* Edinburgh Review.